

AbstractID: 5498 Title: Extracapsular Radiation Dose Annulus Correlates with Biochemical Control in Low-Risk Brachytherapy Patients: Results of a Prospective Randomized Trial

Purpose: Recent studies have suggested that extracapsular permanent prostate brachytherapy treatment margins correlate with biochemical control. It is likely that volumetric dosimetric parameters will be more robust than selected radial measurements. We evaluated the impact of extracapsular volumetric dosimetric parameters on biochemical control in low-risk patients.

Materials and Methods: 263 consecutive low-risk prostate cancer patients randomized to Pd-103 versus I-125 were implanted with a brachytherapy target volume consisting of the prostate with a 5 mm periprostatic margin. The median follow-up was 4.2 years. All patients were implanted at least 3 years prior to analysis. Within 2 hours of implantation, an axial CT was obtained for post-implant dosimetry. A 5 mm 3-dimensional periprostatic annulus was constructed around the prostate gland and evaluated in its entirety and in 90° segments. Dosimetric parameters for the prostate gland and the annulus consisted of V100/150/200 and D90. Biochemical progression-free survival was defined by a PSA \leq 0.5 ng/mL.

Results: Mean postoperative dosimetry was significantly different ($p < 0.001$) between I-125 versus Pd-103, respectively, for V100 of 97% versus 93% and D90 of 122% versus 112%. Annulus dosimetry was significant ($p < 0.001$) for a V100 of 80% versus 70% and a D90 of 91% versus 85% for I-125 versus Pd-103, respectively. Six-year biochemical progression-free survival was 99.6% versus 99.2% for I-125 versus Pd-103 ($p = 0.125$). The most recent median post-treatment PSA was 0.1 ng/mL and < 0.04 ng/mL for I-125 and Pd-103. Biochemically disease-free patients had statistically higher prostate and annular dosimetric values. In Cox regression analysis, variants of annulus dosimetry were the best predictors for biochemical control in the I-125, Pd-103, and overall cohorts.

Conclusions: A postimplant 5 mm 3-dimensional periprostatic annulus provides substantial information regarding dosimetric coverage and appears to be an important predictor for biochemical outcome in low-risk patients.